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Docket No. 15268.1 AF

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OIPE JC59 JUL 08 2004 PATENT & TRADEMARK OFFICE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of	Gast et al.	)
Serial No.	09/646,767	) Art Unit) 3641
Confirmation No.	7760	)
Filed:	November 30, 2000	)
For:	PROPELLANTS FOR GAS GENERATOR	)
Examiner:	Aileen Baker Felton	)

Mail Stop APPEAL BRIEF - PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Transmitted herewith are the following for entry in the above-identified application:

- Appeal Brief and Appendix (each in triplicate)

X Enclosed with this transmittal is a Form PTO-2038 in the amount of $330 for filing brief in support of appeal.

X The Commissioner is hereby authorized to charge payment of any other fees associated with this communication or credit any overpayment to Deposit Account No. 23-3178. Duplicate copies of this sheet are attached.

Dated this 8th day of July 2004.

Respectfully submitted,

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EXPRESS MAIL LABEL NO. EV443087875US

PATENT APPLICATION
Docket No. 15268.1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:		)
	Gast et al.	)
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For:	PROPELLANTS FOR GAS GENERATOR	)
Examiner:	Aileen Baker Felton	)

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I hereby certify that following documents are being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 C.F.R. § 1.10 on the date indicated below in an envelope addressed to: Commissioner of Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Date of deposit: July 8, 2004.

- Appeal Brief (in triplicate)
- Appendix (in triplicate)
- Forms PTO-2038 in the amount of $330
- Transmittal Letter
- Postcard

Respectfully submitted,

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OIPE JC59
JUL 08 2004
PATENT & TRADEMARK OFFICE

EXPRESS MAIL LABEL NO. EV443087875US

PATENT APPLICATION
Docket No. 15268.1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND
INTERFERENCES

In re application of		)
	Gast et al.	)
Serial No	09/646,767	) Art Unit
		) 3641
Confirmation No.	7760	)
Filed	November 30, 2000	)
For	PROPELLANTS FOR GAS GENERATOR	)
Examiner	Aileen Baker Felton	)
Customer No.:	022913	)

APPEAL BRIEF OF APPELLANTS

Mail Stop Appeal Briefs - Patent
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Appellants Eduard Gast, Bernhard Schmid, and Peter Semmler, previously filed a timely Notice of Appeal from the action of the Primary Examiner in finally rejecting all of the claims in this application. This Appeal Brief is being filed under the provisions of 35 U.S.C. § 134(a) and 37 C.F.R. § 1.192.

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REAL PARTY IN INTEREST

NIGU Chemie GmbH is the real party in interest, as evidenced by the front page of International Application Publication WO 99/48843, of which the current application is a national phase application filed under 35 U.S.C. § 371.

RELATED APPEALS AND INTERFERENCES

None.

STATUS OF CLAIMS

Pending claims: 1-23.

Rejected claims: 1-4 and 9-22.

Allowed claims: 23.

Claims objected to: 5-8.

Appealed claims: 1-4 and 9-22.

STATUS OF AMENDMENTS

Amendment "D" and Response After Final Rejection under 37 C.F.R. § 1.116, filed March 16, 2004, has not been entered according to the Advisory Action dated April 1, 2004.

SUMMARY OF THE INVENTION

The present invention is directed to propellants for gas generators used in deploying safety air bags in automobiles. The propellants comprise (a) at least one fuel, (b) at least one oxidizing agent, and (c) at least one slag trap comprising particles formed by a gas phase reaction and that have a specific surface area of at least about 40 m^2/g. *See* Application, Claim 1. Claims 9 and 22 further define the slag trap particles as being "highly dispersed", which is a literal translation of a German term meaning that the particles have a highly resolved lattice structure.

The slag trap particles act as an internal filter within the propellants during combustion that substantially prevents the formation and expulsion of solid powder particles from the gas

generator. *See* Application, page 1, first paragraph; page 9, last paragraph through page 11, second paragraph. The slag trap particles preferably have a high fusion point so that they do not melt during combustion but remain in their original condition so as to function as a slag trap during the entire combustion process. Slag trap particles that are "highly dispersed" cause cooling of the liquid or molten burn-up products to a solid state, and they have a large surface area (at least about 40 m^2/g). Whereas the slag trap particles have a high surface area by virtue of being formed by a gas phase reaction and/or being "highly dispersed", the converse is not necessarily true—particles that have a high surface area are not necessarily formed in a gas phase reaction or are "highly dispersed".

The claimed slag trap particles simplifies the filter in the housing of the gas generator by at least in part eliminating additional mechanical fine filters. This reduces the weight of the air bag gas generator. It also reduces the potential health hazard associated with dust-type particles that might otherwise be expelled by the gas generator and enter a person's lungs. The ability of the claimed slag trap particles to trap molten slag particles formed when the claimed propellants are combusted provides a solution to a problem that is not recognized, understood or discussed in any of the cited references.

ISSUES

1. Whether claims 1-4 and 9-22 are unpatentable under 35 U.S.C. § 103 as being obvious over U.S. Patent No. 6,149,745 to *Matsuda* et al. ("*Matsuda*") in view of U.S. Patent No. 5,827,996 to *Yoshida* et al. ("*Yoshida*").

2. Whether claims 1-4 and 9-22 are unpatentable under 35 U.S.C. § 103 as being obvious over U.S. Patent No. 6,190,474 to *Yamato* ("*Yamato*") in view of *Yoshida*.

GROUPING OF CLAIMS

Claims 1-4 and 10-21 stand or fall together.

Claims 9 and 22 stand or fall together.

ARGUMENT

I. SUMMARY OF OFFICE ACTIONS

A. Office Action Dated January 16, 2004

The Office Action of January 16, 2004 ("Office Action") finally rejected claims 1-4 and 9-22 under 35 U.S.C. § 103(a) as being unpatentable over *Matsuda* in view of *Yoshida*. The Office Action also finally rejected claims 1-4 and 9-22 under 35 U.S.C. § 103(a) as being unpatentable over *Yamato* in view of *Yoshida*. Because neither *Matsuda* nor *Yamato* ("primary references") teach or suggest every limitation recited in the claims, the Office Action combined these two admittedly deficient references with *Yoshida* ("secondary reference") in an effort to show that the claims are obvious over the combination.

More specifically, this and previous office actions have acknowledged that, among other things, neither *Matsuda* nor *Yamato* teach or suggest the use of the claimed slag trap particles in a propellant for gas generators. For this reason, the Office Action combined the primary references with *Yoshida* which, although silent with respect to trapping slag particles, discloses a burn catalyst that the Office Action is similar to the claimed slag trap particles.

B. Advisory Action Dated April 1, 2004

Amendment "D" and Response was filed March 16, 2004 in response to the Office Action and as a follow up to an Examiner Interview held the same day. Although this amendment did not amend any claims but merely argued the inadequacy of the rejections set forth in the Office Action, an Advisory Action was issued April 1, 2004 on the grounds that the arguments set forth in Amendment "D" and Response "present new issues and are not

persuasive". However, the Advisory Action failed to explain how new issues can arise by mere argumentation alone, identify what the new issues were, or show why the arguments were not persuasive. It appears likely that the Examiner simply refused to consider the arguments set forth in Amendment "D" and Response.

II. INCORPORATION OF PREVIOUS ARGUMENTS

Appellants incorporate by reference the arguments in support of patentability set forth in Amendment "D" and Response in their entirety. To the extent they still apply, Appellants also incorporate the arguments set forth in Amendment "C" and Response filed November 6, 2003.

III. THE OFFICE ACTION FAILS TO STATE A PRIMA FACIA CASE OF OBVIOUSNESS RELATIVE TO CLAIMS 1-4 AND 9-22 BASED ON THE COMBINATIONS OF *MATSUDA* AND *YOSHIDA* AND *YAMATO* AND *YOSHIDA*

The Office Action fails to state a *prima facie* case of obviousness over the cited art because it (1) fails articulate any valid motivation to combine the references, (2) fails to show where the combined teachings of the applied art teach or suggest every limitation recited in the claims, and/or (3) fails to show that there would have been a reasonable expectation of success based on the prior art rather than Appellants' own application. See MPEP § 2143. Failure to establish any one of the three requirements set forth in MPEP § 2143 is fatal to a rejection.

A. The Office Action Fails to Articulate any Valid Motivation for Combining the Applied Art

1. *The Alleged Motivation for Combining Matsuda and Yoshida is Based on Mischaracterizations and Unsupported Assumptions Regarding the Compositions Disclosed Therein*

The Office Action alleges the following motivation for combining *Matsuda* with *Yoshida*:

> It would have been obvious to use the titanium dioxide taught by *Yoshida* et al with the composition of *Matsuda* since *Yoshida* suggests that it will function to reduce the concentrations of CO and NOx and this is the purpose of the titanium oxide fiber disclosed in *Matsuda*.

Office Action, page 3 (emphasis added).

There are at least two errors contained in the foregoing statement: (1) reducing the concentration of CO and NOx is not taught in *Matsuda*; and (2) *Matsuda* does not teach or suggest the use of titanium oxide fiber. In addition, Appellants learned during the Examiner Interview that the Examiner believes (albeit erroneously) that the catalysis function disclosed in *Yoshida* to be inherently the same as the scavenging function disclosed in *Matsuda*.

First, *Matsuda* neither teaches nor suggests anything with respect to reducing the concentration of CO and NOx. *Matsuda* discloses "a gas generant composition containing a fuel comprising a metal azide or an organic compound, an oxidizing agent, and at least one additive selected from a ceramic whisker or fiber." Col. 2, lines 15-18. Previous office actions identified the "ceramic whisker or fiber" as being similar to the slag trap particles of the present invention. While *Matsuda* suggests that the ceramic whisker or fiber provides "a scavenging effect of a solid residue" there is no teaching or suggestion that they "will function to reduce the concentrations of CO and NOx" as alleged in the Office Action. See *Matsuda*, col. 2, lines 50-65; Office Action, page 3. Moreover, the *Yoshida* does not teach that the burning catalyst actually interacts with CO and NOx, only that it "decrease[s] the burning temperature" so as to "reduce the concentration of CO and NOx". *Yoshida*, col. 5, lines 24-26.

Second, *Matsuda* neither teaches nor suggests the use of "titanium dioxide fiber". See *Matsuda*, col. 2, lines 50-65 (which only discloses "whiskers or fibers selected from aluminum borate, potassium titanate, alumina, aluminum silicate, zirconium oxide, and zinc oxide"). When confronted with this error during the Examiner Interview, the Examiner represented that she meant to say that *Matsuda* teaches the use of "zirconium oxide" fibers rather than "titanium dioxide" fibers and admitted that the Office Action contains a typographical error. Aside from the fact that the Examiner never attempted to correct this admitted typographical error (i.e., no

supplemental office action was ever sent), this new argument is equally off-base because *Yoshida* neither teaches nor suggests the use of zirconium oxide particles. According to *Yoshida*,

> Specific examples of the oxides of metals of the 4 to 6 periods in the periodic table are copper oxide, nickel oxide, cobalt oxide, iron oxide, chromium oxide, manganese oxide, zinc oxide, calcium oxide, titanium oxide, vanadium oxide, cerium oxide, holmium oxide, ytterbium oxide, molybdenum oxide, tungsten oxide, antimony oxide, tin oxide, titanium oxide and the like. Among them, copper oxide, nickel oxide, cobalt oxide, molybdenum oxide, tungsten oxide, iron oxide, tin oxide, zinc oxide and chromium oxide are preferred, and CuO, CoO, NiO, Ni_2O_3, MoO_3, Cr_2O_3, TiO_2, SnO, ZnO and Fe_2O_3 are particularly preferred.

Col. 5, lines 32-42. Therefore, the supposed clarification by the Examiner during the Examiner Interview provides no more motivation to combine *Yoshida* with *Matsuda* than the admitted typographical error contained in the Office Action.

In fact, none of the substances used to make the "ceramic whiskers or fibers" of *Matsuda* are disclosed in *Yoshida*, and none of the substances used to make the "burning catalyst" in *Yoshida* are disclosed in *Matsuda*. They appear to be mutually exclusive sets. Not only that, they serve entirely different functions (i.e., the ceramic whisker or fiber of *Matsuda* is used to scavenge "solid residue" whereas the burning catalyst of *Yoshida* is used to reduce the burning temperature). Because of this, there would have been no motivation to combine *Matsuda* with *Yoshida*, let alone to obtain a propellant composition that contains the specific slag trap recited in claims 1 and 22 (i.e., a slag trap that is "at least one of Al_2O_3, TiO_2, or ZrO_2 particles formed by a gas phase reaction").

Third, notwithstanding the views to the contrary expressed by the Examiner during the Examiner Interview, the function of the "ceramic whisker or fiber" of *Matsuda* appears to have nothing to do with the function of the "burning catalyst" disclosed in *Yoshida*. According to *Yoshida*, "[t]he burning catalyst is considered to serve mainly to decrease the burning temperature and reduce the concentrations of CO and/or NOx in the gas." *Id.* at col. 5, lines 24-

26. In contrast, the purpose of the ceramic whisker or fiber of *Matsuda*, though not altogether clear, seems to be for the purpose of "scavenging". *See* Matsuda, col. 2, line 61. When Appellants' representative tried to explain the difference between a "scavenging" and "catalysis" during the Examiner Interview, the Examiner responded by feigning that she could see no difference between the two.[1]

It is clear that the terms "scavenge" and "scavenger" mean something quite different than "catalyze" and "catalyst". According to THE American Heritage Dictionary Of The English Language 1160 (1981) (a copy of which is attached as Exhibit A), the word "scavenge" means: "1. To collect and remove refuse from; clean up."; "5. *Metallurgy*. To clean (molten metal) by chemically removing impurities". The word "scavenger" similarly means: "3. *Chemistry*. A substance added to a mixture to remove impurities or to counteract the undesirable effects of other constituents". *Id.* Thus, "scavenge" and "scavenger" refer to a process or substance that physically collects or gathers something. A scavenger has a finite ability to scavenge (i.e., once full or spent it can no longer scavenge)

In contrast, the word "catalyze" means "[t]o modify the rate of (a chemical reaction) as a catalyst". THE AMERICAN HERITAGE DICTIONARY OF THE ENGLISH LANGUAGE 211 (1981) (a copy of which is attached as Exhibit B). The word "catalyst" similarly means: "1. *Chemistry*. A substance, usually present in small amounts relative to the reactants, that modifies, especially increases, the rate of a chemical reaction without being consumed in the process." *Id.* Thus, "catalyze" and "catalyst" refer to a process or substance that increases the rate of a chemical reaction without itself being consumed. The nature of a catalyst is that it promotes a chemical reaction; it does not scavenge, collect or hold impurities. In fact, the ability of a catalyst to

[1] When asked if she knew the difference between a "scavenger" and a "catalyst" the Examiner became defensive and indignant toward Appellants' representative.

catalyze a reaction is theoretically infinite. In view of the foregoing, the Examiner's view that "scavenging" and "catalysis" mean essentially the same thing is clearly erroneous.

In view of the foregoing, Appellants submit that the alleged motivation for combining *Matsuda* and *Yoshida* is in error. For at least this reason, the Office Action fails to state a prima facia obviousness rejection of claims 1-4 and 9-22 over *Matsuda* and *Yoshida*. See MPEP § 2143.

2. *The Alleged Motivation for Combining Yamato and Yoshida is Illogical and Incomplete*

Yamato is even more deficient than *Matsuda* with respect to the claimed slag trap particles because, unlike the ceramic whisker of fiber *Matsuda*, the *Yamato* composition does not include any component that can arguably trap slag. For this reason, there is a clear gap in the Examiner's reasoning. It's as if the Examiner were relying on the same erroneous argument made with respect to *Matsuda* and *Yoshida* except the Office Action fails to mention either *Matsuda* or any component in *Yamato* that is arguably similar to the "burning catalyst" of *Yoshida*. In fact, the alleged motivation for combining *Yamato* and *Yoshida* at page 4 of the Office Action does not even allege that the "burning catalyst" of *Yoshida* provides the same or similar function as any component disclosed in *Yamato*. According to the Office Action,

> It would have been obvious to use the titanium dioxide taught by *Yoshida* et al with the composition of *Yamato* since *Yoshida* suggests that it will function to reduce the concentrations of CO and NOx. Since combustion of the similar composition of *Yamato* will result in slag formation it would be a benefit to use the titanium oxide teaching to reduce the formation of harmful CO and NOx.

Office Action, page 4. The alleged motivation to combine *Yamato* with *Yoshida* is therefore less persuasive than the alleged motivation to combine *Matsuda* with *Yoshida*, discussed above.

More fundamentally, the alleged motivation to combine *Yamato* with *Yoshida* is illogical on its face because there is no technical relationship between trapping slag (which is solid or molten) allegedly produced by the *Yamato* composition and using the burning catalyst of

Yoshida to "decrease the burning temperature and reduce the concentrations of CO and NOx" (which are gases). See *Yoshida*, col. 5, lines 24-26. That *Yoshida* teaches the use of a burning catalyst to reduce the burning temperature of the disclosed composition provides absolutely no motivation to modify *Yamato* in a manner that would trap slag *(i.e.*, by using the claimed slag trap particles in the present application).

Moreover, the alleged motivation to combine *Yamato* with *Yoshida* begs the question as to why one of skill in the art would have been motivated to modify *Yamato* to trap slag allegedly produced by the *Yamato* composition. Since neither *Yamato* nor *Yoshida* state anything with respect to slag formation, let alone that it might be desirable or beneficial to trap such slag, the combined teachings of these two references provide no motivation or suggestion to solve this unknown problem.

In view of the foregoing, Appellants submit that the alleged motivation for combining *Yamato* and *Yoshida* is in error. For at least this reason, the Office Action fails to state a prima facia obviousness rejection of claims 1-4 and 9-22 over *Yamato* and *Yoshida*.

B. <u>The Office Action Fails to Show That the Combined Teachings of the Applied Art Teach or Suggest Every Claim Limitation</u>

Claim 1 recites the inclusion of slag trap "particles formed by a gas phase reaction". Claims 9 and 22 further require such particles to be "highly dispersed". The advantage of such particles in trapping slag is clearly explained in the description of the invention. Application, page 9, last paragraph through page 11, second paragraph. As discussed in previous amendments, the ceramic whiskers or fibers of *Matsuda* are neither "formed by a gas phase reaction" nor are they "highly dispersed" (i.e., have "a large inner surface" as a result of having "highly resolved lattices"). Moreover, the Office Action fails to even allege that any of *Matsuda*, *Yamato* or *Yoshida* teach or suggest the use of slag trap "particles formed by a gas phase

reaction", as recited in independent claims 1 and 22, let alone particles of this type that are also "highly dispersed", as further recited in claims 9 and 22.

Rather than showing where the cited art teaches or suggests the use of "particles formed by a gas phase reaction" and/or particles that are "highly dispersed", the Office Action argues that the burning catalyst particles of *Yoshida* inherently do the same thing as the claimed slag trap particles. Office Action, page 5. Whether true or not, that assertion entirely misses the point. It is not enough for an Examiner to simply allege that one or more of the recited elements inherently behave, or perform the same or similar function, as allegedly similar elements taught in the cited art. In order for there to be *prima facie* obviousness, "the prior art reference (or references when combined) must teach or suggest all the claim limitations". MPEP § 2143 (emphasis added). The Office Action fails to make this required showing.

In short, Appellants submit that the Office Action has failed to show where *Matsuda*, *Yamato* and *Yoshida* "teach or suggest all the claim limitations" as required by MPEP § 2143. For this additional reason, the Office Action fails to state a prima facia obviousness rejection of claims 1-4 and 9-22 over either *Matsuda* and *Yoshida* or *Yamato* and *Yoshida*. See id.

C. The Office Action Fails to Show Where the Prior Art Provides a Reasonable Expectation of Success

The purpose of the slag trap particles recited in claims 1 and 22 is to trap slag that is generated during combustion of the claimed propellant composition in order to facilitate the removal of slag by filtration. The Office Action assumes, without citing to any teaching in the art, that combining the primary references with *Yoshida* would inherently yield a composition capable of trapping slag produced during burning of a gas generating propellant composition. *See* Office Action, pp. 5-6. In support of this notion, the Office Action insinuates, without providing any evidence, that the current application merely calls the elements disclosed in the

cited art by a different name. *Id.* In particular, the Office Action argues that "Applicant cannot remove the effects of these components merely by calling them by another name". *Id.* at page 5. However, that statement begs the question as to whether the components disclosed in the cited art would, in fact, be reasonably expected to succeed in removing slag from a burning propellant composition. That utilizing the "burning catalyst" of *Yoshida* in place of the ceramic whisker or fiber of *Matsuda* (or within the *Yamato* composition) might reasonably be expected to succeed in reducing the "burning temperature" and "the concentrations of CO and/or NOx" provides no hint with respect to any likelihood or expectation that it would be able to trap slag produced by a propellant composition during combustion.

It appears that the Examiner's notion that the burning catalyst of *Yoshida* would be reasonably expected to act as a slag trap was derived from the present application, not any identifiable teaching found in the art. However, the MPEP is clear that the reasonable expectation of success "must . . . be found in the prior art, not in applicant's disclosure". MPEP § 2143 (emphasis added) (citing *In re* Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991)). This requirement prevents an examiner from using hindsight to piece together otherwise disparate and unrelated teachings using an applicant's own disclosure as a guide (which is precisely what appears to have happened in the present application).

For this yet this additional reason, Appellants submit that the Office Action fails to state a *prima facia* obviousness rejection of claims 1-4 and 9-22 over either *Matsuda* and *Yoshida* or *Yamato* and *Yoshida.* See MPEP § 2143.

IV. THE OFFICE ACTION MISCHARACTERIZES THE CLAIMS AT ISSUE, THEREBY EVIDENCING THAT THE EXAMINER FAILED TO CONSIDER ALL THE CLAIM ELEMENTS

When responding to the arguments set forth in Amendment "C" and Response regarding the claimed slag trap particles, the Office Action denies that the claims even require particles:

"applicant's claims do not require a particle, the claims only require a certain surface area". Office Action, p. 4 (emphasis added). This statement by the Examiner is clearly erroneous because claims 1 and 22 each recite "particles formed by a gas phase reaction" (emphasis added). Because the rejections of Appellants' claims and previous arguments were based on a clearly erroneous assumption on the part of the Examiner (*i.e.*, that the "claims do not require a particle"), this is further evidence that the Examiner failed to consider all of the claim elements when comparing the claims to the cited art, in violation of MPEP § 2143.

Moreover, because the Office Action clearly evidences that the Examiner gave no patentable weight to the word "particles" found in claims 1 and 22, it necessarily follows that the Examiner gave no patentable weight to other important modifiers found in the claims (*i.e.*, particles "formed by a gas phase reaction" and/or particles that are "highly dispersed"). For this additional reason Appellants submit that the Office Action fails to show that the combined references "teach or suggest all the claim limitations". MPEP § 2143 (emphasis added).

V. THE OFFICE ACTION FAILS TO SUPPORT ITS INHERENCY ARGUMENTS WITH ANY EVIDENCE BUT INSTEAD APPEARS TO RELY ON HINDSIGHT

When rejecting the arguments set forth in Amendment "C" and Response, the Office Action expresses the opinion that the burning catalyst of *Yoshida* would inherently act to trap slag. Office Action, pp. 5-6. However, simply alleging that a substance inherently performs a function without providing supporting evidence is improper. According to MPEP § 2112,

> **EXAMINER MUST PROVIDE RATIONALE OR EVIDENCE TENDING TO SHOW INHERENCY**
>
> The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic. *In re Rijckaert*, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993) (reversed rejection because inherency was based on what would result due to optimization of conditions, not what was necessarily present in the prior art); *In re Oelrich*, 666 F.2d 578, 581-82, 212 USPQ 323, 326 (CCPA 1981). "To establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary

skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.' " *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999) (citations omitted) (The claims were drawn to a disposable diaper having three fastening elements. The reference disclosed two fastening elements that could perform the same function as the three fastening elements in the claims. The court construed the claims to require three separate elements and held that the reference did not disclose a separate third fastening element, either expressly or inherently.).

"In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art." *Ex parte Levy*, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990) (emphasis in original) (Applicant's invention was directed to a biaxially oriented, flexible dilation catheter balloon (a tube which expands upon inflation) used, for example, in clearing the blood vessels of heart patients). The examiner applied a U.S. patent to Schjeldahl which disclosed injection molding a tubular preform and then injecting air into the preform to expand it against a mold (blow molding). The reference did not directly state that the end product balloon was biaxially oriented. It did disclose that the balloon was "formed from a thin flexible inelastic, high tensile strength, biaxially oriented synthetic plastic material." *Id.* at 1462 (emphasis in original). The examiner argued that Schjeldahl's balloon was inherently biaxially oriented. The Board reversed on the basis that the examiner did not provide objective evidence or cogent technical reasoning to support the conclusion of inherency.).

In the present case, the Examiner relies on the unsupported assertion that the "burning catalyst" of *Yoshida* inherently functions as a "slag trap" within the meaning of this term as defined and claimed in the present application. Office Action, pp. 5-6. When asked by Appellants' representative during the Examiner Interview how the Examiner knew this, the Examiner simply asserted that "that's what they [titanium particles] do". However, none of the art cited in the Office Action teach or suggest this concept. According to MPEP § 2112 the PTO has therefore failed to meet its burden of showing that the "burning catalyst" of *Yoshida* inherently behaves as a slag trap. Whereas the Office Action flippantly states that "the Applicant appears to argue that he has somehow changed titanium oxide to make it work differently than it does for everyone else", this doesn't change the fact that the Office Action fails to provide any "objective evidence or cogent technical reasoning" that the burning catalyst of *Yoshida* inherently constitutes a "slag trap" as defined in claims 1 and 22, as required by MPEP § 2112.

Indeed, notwithstanding the Examiner's barb, Appellants never said that they somehow caused the burning catalyst of *Yoshida* to behave differently "than it does for everyone else". As stated above, claims 1 and 22 do not claim the use of particles (including titanium dioxide particles) that somehow act differently than what is described in *Yoshida*, but "slag trap . . . particles" that are "formed by a gas phase reaction" and/or that are "highly dispersed". Claims 1 and 22 do not purport to encompass any other type of particles, including burning catalyst particles, nor have Appellants ever argued that they do. It is the Examiner, not Appellants, who alleges that *Yoshida* inherently discloses slag trap particles. For the Examiner to sarcastically assert that Appellants have argued that they have "somehow changed titanium oxide to make it work differently than it does for everyone else" is circular reasoning based on the Examiner's initial unsupported assertion that *Yoshida* inherently discloses slag trap particles. As stated above, MPEP § 2112 requires more than mere assertions or possibilities when alleging inherency. It requires "objective evidence" and "cogent technical reasoning to support the conclusion of inherency". The Office Action has provided neither.

Moreover, the allegation that the "burning catalyst" of *Yoshida* would successfully trap slag appears to be based entirely on hindsight, using the present application as a template to piece together other disparate and unrelated teachings in the cited art. The only teaching in the record for the proposition that titanium dioxide particles having a specific surface area of at least about 40 m^2/g are good at trapping slag is found in the present application. It is well-established that hindsight analysis is not a legitimate basis for rejecting claims.

Finally, in the context of obviousness, inherency is largely immaterial. The CCPA clearly stated that

> [t]he inherency of an advantage and its obviousness are entirely different questions. That which may be inherent is not necessarily known. Obviousness cannot be predicated on what is unknown.

In re Shetty, 566 F.2d 81, 86, 195 USPQ 753, 756-57 (CCPA 1977) (emphasis added) (quoting *In re Spormann*, 363 F.2d 444, 448, 150 USPQ 449, 452 (CCPA 1966)); *See also In re Naylor*, 369 F.2d 765, 768, 152 USPQ 106, 108 (CCPA 1966) ("[Inherency] is quite immaterial if . . . one of ordinary skill in the art would not appreciate or recognize the inherent result"); *In re Rijckaert*, 9 F.3d 1531, 1533, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993).

In the present case, the Office Action argues that including titanium dioxide would inherently act as a slag trap, but since the prior art does not recognize what a slag trap is, the position of the Office Action begs the question as to why one of skill in the art would have been motivated in the first place to make the alleged modification of the primary references to include the burning catalyst of *Yoshida*. The entire rejection appears to rest on (1) hindsight as the only motivation to combine the primary and secondary references and (2) an assertion of inherency, based either on hindsight or pure conjecture, as the sole justification as to why the combination and alleged modification makes any sense.

VI. CLAIMS 1-4 AND 9-22 ARE NOT PRIMA FACIA OBVIOUS OVER THE COMBINATION OF *MATSUDA* OR *YAMATO* AND *YOSHIDA*

In addition to the factually inaccurate and legally unjustifiable rejections set forth in the Office Action, claims 1-4 and 9-22 are, in fact, unobvious over the cited art. As stated above, *Matsuda* neither teaches nor suggests the use of slag trap particles. In fact, *Matsuda* appears to teach away from the use of particles by arguing that ceramic whiskers or fibers are superior to particles with respect to their respective "scavenging effect[s]": "A whisker or fiber is short in a length and small in an aspect ratio, and a particulate one is notably reduced in a scavenging effect of a solid residue since it is not arranged in a steric network form." *Matsuda*, col. 2, lines 59-63 (emphasis added). Such scavenging of the "solid residue" is evidently the result of the whisker or fiber being "arranged in a steric network form", unlike "a particulate one", which is

not so arranged. *See id.* Moreover, because *Matsuda* expressly teaches that particles are "not arranged in a steric network form" (col. 2, lines 59-63), one of skill in the art clearly would not have been motivated to substitute the ceramic whisker or fiber of *Matsuda* with the burning catalyst particles of *Yoshida*. Therefore, one of skill in the art would not have been motivated to modify *Matsuda* by replacing the ceramic whisker or fiber with particles, let alone the burning catalyst particles of *Yoshida*, which do not even remotely perform the same function as the ceramic whisker or fiber of *Matsuda*. *See W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), cert. denied, 469 U.S. 851 (1984) (A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention).

Moreover, the statement comparing the scavenging effect of the ceramic whisker or fiber and particles refers to the "scavenging effect of a solid residue". *Matsuda*, col. 2, lines 59-63 (emphasis added). In contrast, "slag" trapped by the claimed slag trap particles of the present application are believed to be molten, not a "solid residue. Moreover, whereas the claimed slag trap particles are capable of trapping molten slag by virtue of their high surface area as a result of how they are formed (i.e., by a gas phase reaction), the ceramic whisker or fiber of *Matsuda* evidently scavenge as a result of being "arranged in a steric network form" (i.e., the fibers or whiskers themselves apparently form some sort of microscopic net or filter for the solid residue). There is no teaching or suggestion that the ceramic whisker or fiber disclosed in *Matsuda* has a high specific surface area or that they are capable of acting as a slag trap for initially molten slag.

Yamato is even further removed from the claims of the present invention because it neither teaches nor suggests any component that can even remotely be considered to be a slag trap. The only document that teaches that high surface area particles can act as a slag trap is the present application, which is not available for purposes of establishing motivation to combine.

Nor can any reasonable expectation of success be found in the prior art. The only document that teaches that high surface area particles might, when properly selected, act to trap slag is the present application, which is not available for purposes of showing reasonable expectation of success.

Finally, the combined teachings of *Matsuda* and *Yoshida* or *Yamato* and *Yoshida* fail to teach or suggest every limitation found in the claims (*e.g.*, "slag trap . . . particles formed by a gas phase reaction", as recited in claims 1 and 22, or "slag trap . . . particles" that are "highly dispersed", as further recited in claim 22). The claims are not only limited to particles that have a specific surface area, but only those particles that are formed in a certain manner (*i.e.*, by a gas phase reaction) that renders them suitable for use as a slag trap. Particles that do not act as a slag trap, even particles having a high specific surface area within the claimed parameters, do not meet the "slag trap . . . particles" limitation of the claims.

In short, none of the applied art teaches or suggests how to select particles, from among the universe of particles, that would be suitable as a slag trap. Moreover, none of the applied art even recognizes the importance of trapping slag, or that failing to trap slag formed during combustion or a propellant is even a problem that needs a solution. For that reason, the applied provides no teaching or suggestion that would have motivated one of skill in the art to modify *Matsuda* or *Yamato* to include "slag trap . . . particles" of any kind, let alone slag trap particles having the specific characteristics recited in claims 1 and 22.

VII. CLAIMS 1-4 AND 9-22 CLAIM A COMPOSITION THAT HAS UNEXPECTED RESULTS RELATIVE TO THE APPLIED ART

Even assuming *arguendo* that claims 1-4 and 9-22 are *prima facie* obvious over the applied art, a point which Appellants in no wise concede, Appellants can rebut *prima facie*

obviousness based on the secondary consideration of unexpected results. According to MPEP § 716.02(a),

> Presence of a property not possessed by the prior art is evidence of nonobviousness. *In re Papesch*, 315 F.2d 381, 137 USPQ 43 (CCPA 1963) (rejection of claims to compound structurally similar to the prior art compound was reversed because claimed compound unexpectedly possessed anti-inflammatory properties not possessed by the prior art compound). . . .

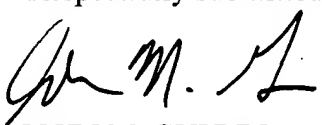
In the present case, claims 1 and 22 claim a propellant that includes "slag trap . . . particles", which, according to evidence set forth in the application, are capable of acting as an internal filter that traps slag. *See* Application, page 1, first paragraph; page 9, last paragraph through page 11, second paragraph. This is an unexpected result. While it may have been known that certain types of particles help catalyze combustion of propellant compositions (*e.g.*, so as to reduce burning temperature and reduce concentrations of CO and NOx, as taught in *Yoshida*), it was unknown that particles "formed by a gas phase reaction" and/or that are "highly dispersed" are capable of trapping slag. That is further evidence that the claims are unobvious over the applied art.

PRAYER FOR RELIEF

In view of the foregoing, Appellants respectfully request the Board to vacate the final rejection and order the Examiner to allow each of the claims on appeal.

Dated this 8th day of July 2004.

Respectfully submitted,



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scepter
Scepter of Charles V of France

scaup
Aythya affinis
Lesser scaup

scat[2] (skăt) *n.* A type of jazz singing consisting of the improvisation and repetition of meaningless syllables sung to a melody. —*intr.v.* **scatted, scatting, scats.** To sing in this manner. [Perhaps imitative.]

scat[3] (skăt) *n.* Any of several freshwater fishes of the genus *Scatophagus,* of tropical Asia and adjacent areas, having a flat, rounded, spotted or striped body, and popular as an aquarium fish. [Shortened from New Latin *Scatophagus,* from Greek *skatophagos,* SCATOPHAGOUS.]

scat[4] (skăt) *n.* The excrement of an animal, especially a game animal. [Probably from SCATO-.]

scathe (skāth) *tr.v.* **scathed, scathing, scathes.** 1. To harm or injure severely, especially by fire or heat; wither; sear. 2. To criticize severely. —*n.* Harm; injury. [Middle English *skathen,* from Old Norse *skadha.* See **skēth-** in Appendix.*]

scath·ing (skā′thĭng) *adj.* 1. Extremely severe or harsh; bitterly denunciatory: *"a scathing tract on the uselessness of war"* (Pierre Brodin). 2. Harmful or painful; injurious.

scato-. Indicates feces or excrement; for example, **scatology.** [Greek *skato-,* from *skōr* (genitive *skatos*), dung, ordure. See **sker-**[4] in Appendix.*]

sca·tol·o·gy (skə-tŏl′ə-jē, skă-) *n.* 1. The study of fecal excrement, as in medicine or paleontology. 2. a. An obsession with excrement or excretory functions. b. The psychiatric study of such an obsession. 3. Preoccupation with obscenity, as in literature. [SCATO- + -LOGY.] —**scat′o·log′i·cal** (skăt′ə-lŏj′ĭ-kəl), **scat′o·log′ic** *adj.* —**sca·tol′o·gist** *n.*

sca·toph·a·gous (skə-tŏf′ə-gəs, skă-) *adj.* Feeding on dung, as a beetle or fly. [Greek *skatophagos* : SCATO- + -PHAGOUS.]

scat·ter (skăt′ər) *v.* **-tered, -tering, -ters.** —*tr.* 1. To cause to separate and go in various directions; disperse. 2. To distribute loosely by or as if by sprinkling or strewing. 3. *Physics.* To deflect (radiation or particles). —*intr.* 1. To separate and go in several directions; disperse. 2. To appear, occur, or fall at widely spaced intervals. —*n.* 1. The act of scattering. 2. The condition or extent of being scattered. 3. That which is scattered. [Middle English *scateren,* possibly variant of *schateren,* SHATTER.] —**scat′ter·er** *n.*

Synonyms: *scatter, disperse, dissipate, dispel.* These verbs are compared as they mean to cause something, considered as a mass or aggregate, to break up. *Scatter* usually refers to widespread and often haphazard distribution of components, as persons fleeing a storm or physical objects blown by wind. *Disperse* makes a stronger implication of complete breaking up of the mass, as a crowd of persons routed by police or a mass of clouds acted on by sunlight. *Dissipate* usually implies reduction to nothing, as by squandering (a fortune, time, or energy) or causing something (such as fog or mist) to evaporate. *Dispel* suggests making disappear as if by scattering, often it takes as its object something nonphysical, as a rumor, fear, joy, or doubt.

scat·ter-brain (skăt′ər-brān′) *n.* A person lacking the power of concentration or attention; a flighty, disorganized, or thoughtless person. —**scat′ter-brained′** *adj.*

scat·ter-good (skăt′ər-gōōd′) *n.* A spendthrift; wastrel.

scat·ter·ing (skăt′ər-ĭng) *n.* 1. a. The act or process of dispersing or scattering. b. The state of being dispersed or scattered. 2. A sparse distribution or irregular occurrence of something: *a scattering of applause.* 3. *Physics.* The dispersal of a beam of particles or of radiation into a range of directions resulting from physical interactions. —*adj.* Placed at intervals or occurring irregularly. —**scat′ter·ing·ly** *adv.*

scatter pin. A small brooch often worn in groups of two or three as a decorative accessory for a woman.

scatter rug. A small rug for carpeting a part of a floor. Also called "throw rug."

scat·ter-shot (skăt′ər-shŏt′) *adj.* Covering a wide range in a random way: *scattershot testimony.* [SCATTER + SHOT.]

scaup (skôp) *n.* Either of two diving ducks, *Aythya marila* or *A. affinis,* having predominantly black and white plumage. Sometimes called "bluebill." [Perhaps from *scaup,* variant of SCALP (rare sense "bed of mussels"), because these ducks feed on shellfish.]

scaur. *Scottish.* Variant of **scar** (rock).

scav·enge (skăv′ĭnj) *v.* **-enged, -enging, -enges.** —*tr.* 1. To collect and remove refuse from; clean up. 2. To search through for salvageable material. 3. To collect (salvageable material) by searching. 4. To expel (exhaust gases) from a cylinder of an internal-combustion engine. 5. *Metallurgy.* To clean (molten metal) by chemically removing impurities. —*intr.* To search through discarded material for edible or useful things. [Back-formation from SCAVENGER.]

scav·en·ger (skăv′ĭn-jər) *n.* 1. An animal that feeds on dead animal flesh or other decaying organic matter. 2. One who scavenges. 3. *Chemistry.* A substance added to a mixture to remove impurities or to counteract the undesirable effects of other constituents. [Earlier *scavager,* street-cleaner; Middle English *skawager,* collector of tolls, from Norman French *scawager,* from *scawage,* a toll levied on foreign merchants, variant of Old North French *escauwage,* inspection, from *escauwer,* to inspect; from Flemish *scawuen,* to look at. See **keu-**[1] in Appendix.*]

sce·nar·i·o (sĭ-nâr′ē-ō′, sĭ-när′-) *n., pl.* **-os.** 1. An outline of the plot of a dramatic or literary work. 2. A **screenplay** *(see).* 3. An outline of a hypothesized chain of events. [Italian, "scenery," from Late Latin *scaenārius,* of the stage, from Latin *scaena,* stage, SCENE.]

sce·nar·ist (sĭ-nâr′ĭst, sĭ-när′-) *n.* A writer of screenplays.

scend (sĕnd) *intr.v.* **scended, scending, scends.** Also **send.** To heave upward on a wave or swell. —*n.* Also **send.** The rising movement of a ship on a wave or swell. [Perhaps from earlier *'scend,* short for DESCEND or ASCEND.]

scene (sēn) *n.* 1. A locality as seen by a viewer; view. 2. The surroundings and place where an action or event occurs. 3. *Abbr.* **sc.** The place in which the action of a narrative occurs; setting; locale. 4. *Abbr.* **sc.** A subdivision of an act in a dramatic presentation in which the setting is fixed and the time continuous. 5. *Abbr.* **sc.** A shot or series of shots in a film constituting a unit of continuous related action. 6. The scenery and properties for a dramatic presentation. 7. *Archaic.* A theater stage. 8. A real or fictitious episode, especially when described. 9. A public display of passion or temper. 10. *Slang.* A place or realm of the currently fashionable or exciting. —**behind the scenes.** 1. Backstage. 2. In private. —**make the scene.** *Slang.* To participate in an activity or event. [French *scène,* from Old French *scene,* stage; stage performance, from Latin *scaena,* stage, scene, theater, from Greek *skēnē,* tent.]

scen·er·y (sē′nə-rē) *n.* 1. The landscape. 2. The painted backdrops on a theatrical stage. [Italian *scenario,* SCENARIO.] —**sce′ni·cal·ly** *adv.*

scent (sĕnt) *n.* 1. A distinctive odor. 2. A perfume. 3. An odor left by the passing of an animal. 4. The trail of a hunted animal or fugitive. 5. The sense of smell. 6. A hint of something imminent; suggestion. —See Synonyms at **smell.** —*v.* **scented, scenting, scents.** —*tr.* 1. To perceive or identify by the sense of smell. 2. To suspect or detect as if by smelling: *scent danger.* 3. To perfume. —*intr.* To hunt by means of the sense of smell. Used of hounds. [Middle English *sent,* from *senten,* to smell, scent, from Old French *sentir,* from Latin *sentīre,* to feel. See **sent-** in Appendix.*]

scep·ter (sĕp′tər) *n.* Also *chiefly British* **scep·tre.** 1. A staff held by a sovereign on ceremonial occasions as an emblem of authority. 2. Sovereign office or power. —*tr.v.* **sceptered, -tering, -ters.** Also *chiefly British* **scep·tre, -tred, -tring, -tres.** To invest with royal authority. [Middle English *(s)ceptre,* from Old French, from Latin *scēptrum,* from Greek *skēptron,* "staff," "stick."]

scep·tic. Variant of **skeptic.**

sch. school.

Schau·dinn (shou′dĭn), **Fritz.** 1871–1906. German zoologist; discovered organism that causes syphilis.

Schaum·burg-Lip·pe (shoum′bŏŏrk′lĭp′ə). A former state of northwestern Germany, now part of Lower Saxony, West Germany.

schav (shăv) *n.* A chilled soup made with sorrel, onions, lemon juice, eggs, and sugar, and served with sour cream. [Polish *szczaw,* sorrel, akin to Russian *shchavel'.*]

sched·ule (skĕj′ōōl, -ōō-əl, skĕj′əl; *British* shĕd′yōōl) *n.* 1. A formal written list of items, usually in tabular form, especially a listing of rates or prices. 2. a. A program of forthcoming events or appointments. b. A student's program of classes. 3. A timetable of departures and arrivals. 4. A production plan allotting work to be done and specifying deadlines. 5. A supplemental statement of details appended to a document. —*tr.v.* **scheduled, -uling, -ules.** 1. To enter on a schedule. 2. To make up a schedule for. 3. To plan or appoint for a certain time or date. [Middle English *cedule, sedule,* slip of parchment or paper, short note, from Old French *cedule,* from Late Latin *schedula,* diminutive of Latin *scheda, scida,* papyrus leaf, from Greek *skhidē* (unattested), splinter of wood, from *skhizein,* to split. See **skei-** in Appendix.*]

Schee·le (shā′lə), **Karl Wilhelm.** 1742–1786. Swedish chemist; discovered many acids, gases, and elements.

schee·lite (shā′lĭt′) *n.* A variously colored natural form of calcium tungstate, $CaWO_4$, found in igneous rocks and used as a source of tungsten. [Discovered by Karl SCHEELE.]

Sche·her·a·za·de (shə-hĕr′ə-zä′də, -zäd′). The fictional narrator of *The Arabian Nights' Entertainments.*

Scheldt (skĕlt). *Flemish & Dutch* **Schel·de** (skĕl′də), *French* **Escaut** (ĕs-kō′). A river rising in northern France and flowing 270 miles generally north through Belgium and the southern Netherlands to the North Sea.

Schel·ling (shĕl′ĭng), **Friedrich Wilhelm Joseph von.** 1775–1854. German philosopher.

sche·ma (skē′mə) *n., pl.* **-mata** (-mə-tə). A summarized or diagrammatic representation of something; an outline. [German *Schema,* from Greek *skhēma,* form. See **scheme.**]

sche·mat·ic (skē-măt′ĭk) *adj.* Pertaining to or in the form of a scheme or schema; diagrammatic. —*n.* A structural or procedural diagram, especially of an electrical or mechanical system.

sche·ma·tism (skē′mə-tĭz′əm) *n.* The patterned disposition of constituents within a given system.

sche·ma·tize (skē′mə-tīz′) *tr.v.* **-tized, -tizing, -tizes.** To form into a scheme. [Greek *skhēmatizein,* to give a form to, from *skhēma,* form, manner. See **scheme.**] —**sche′ma·ti·za′tion** *n.*

scheme (skēm) *n.* 1. A systematic plan of action. 2. An orderly combination of related or successive parts or things; system. 3. An underhand or secret plan; plot; intrigue. 4. A visionary plan. 5. A chart, diagram, or outline of a system or object. —**schemed, scheming, schemes.** —*tr.* 1. To contrive a plan or scheme for. 2. To plot. —*intr.* To make devious plans. [Latin *schēma,* form, figure, manner, from Greek *skhēma.* See **segh-** in Appendix.*] —**schem′er** *n.*

Sche·nec·ta·dy (skə-nĕk′tə-dē). A city and industrial center of New York State, in the east on the Mohawk River. Population, 77,000.

scher·zan·do (skĕr-tsän′dō) *adj. Music.* Playful; sportive. Used

as in **catechize**. Greek *kata-*, from *kata*, down, down from, according to. See **kat-**[1] in Appendix.*]

ca·tab·o·lism (kə-tăb′ə-lĭz′əm) *n.* The metabolic change of complex into simple molecules. Compare **anabolism**. [From Greek *katabolē*, a throwing down, from *kataballein*, to throw down : *kata-*, down + *ballein*, to throw (see **gwel-**[1] in Appendix*).] —**cat′a·bol′ic** (kăt′ə-bŏl′ĭk) *adj.* —**cat′a·bol′i·cal·ly** *adv.*

ca·tab·o·lize (kə-tăb′ə-līz′) *v.* **-lized, -lizing, -lizes.** —*tr.* To break down (complex molecules) by metabolic processes. —*intr.* To undergo catabolism.

cat·a·chre·sis (kăt′ə-krē′sĭs) *n., pl.* **-ses** (-sēz′). **1. a.** Strained use of a word or phrase, as for rhetorical effect. **b.** A deliberately paradoxical figure of speech. **2.** The use of a wrong word in a context. [Latin *catachrēsis*, from Greek *katakhrēsis*, excessive use, misuse, from *katakhrēsthai*, to misuse, make full use of : *kata-*, completely + *khrēsthai*, to use (see **gher-**[7] in Appendix*).] —**cat′a·chres′tic** (-krĕs′tĭk) *adj.*

cat·a·clysm (kăt′ə-klĭz′əm) *n.* **1.** A violent and sudden change in the earth's crust. **2.** Any violent upheaval. **3.** A devastating flood. —See Synonyms at **disaster**. [French *cataclysme*, from Latin *cataclysmos*, deluge, flood, from Greek *kataklusmos*, from *katakluzein*, to deluge, inundate : *kata-*, down + *kluzein*, to wash (see **kleu-**[2] in Appendix*).] —**cat′a·clys′mic** (-klĭz′mĭk), **cat′a·clys′mal** (-klĭz′məl) *adj.*

cat·a·combs (kăt′ə-kōmz′) *pl.n.* A series of underground chambers or tunnels with recesses for graves. [From Old French *catacombe*, a subterranean chamber, probably from Old Italian *catacomba*, from Late Latin *catacumbat*.]

ca·tad·ro·mous (kə-tăd′rə-məs) *adj.* Migrating down river to breed in marine waters. Compare **anadromous**. [CATA- + -DROMOUS.]

cat·a·falque (kăt′ə-fălk′, -fôlk′, -fôk′) *n.* The raised structure upon which a coffin rests during a state funeral. [French, from Italian *catafalco*, from Vulgar Latin *catafalicum* (unattested), scaffold : Latin *cata-*, down from + *fala*, scaffold, siege tower, from Etruscan *falaś*.]

Cat·a·lan (kăt′l-ăn′, -ən) *adj.* Of or pertaining to Catalonia, its people, language, or culture. —*n.* **1.** A native or inhabitant of Catalonia. **2.** The Romance language of Catalonia.

cat·a·lase (kăt′l-ās′, -āz′) *n.* An enzyme in the blood and tissues that catalyzes the decomposition of hydrogen peroxide into water and oxygen. [CATAL(YSIS) + -ASE.]

cat·a·lec·tic (kăt′l-ĕk′tĭk) *adj.* Designating a verse that lacks part of the last foot. [Late Latin *catalēcticus*, from Greek *katalēktikos*, incomplete, from *katalēgein*, to leave off : *kata-*, off, away + *lēgein*, to leave off, stop (see **sleg-** in Appendix*).]

cat·a·lep·sy (kăt′l-ĕp′sē) *n.* Muscular rigidity, lack of awareness of environment, and lack of response to external stimuli, often associated with epilepsy, schizophrenia, and hysteria. [Learned respelling of earlier *catalency*, from Middle English *catalempsia*, from Medieval Latin *catalepsia*, from Late Latin *catalēpsis*, from Greek *katalēpsis*, "a seizing," from *katalambanein*, to seize : *kata-*, down from + *lambanein*, to take, seize (see **slagw-** in Appendix*).] —**cat′a·lep′tic** *adj.*

Cat·a·li·na Island. See **Santa Catalina**.

cat·a·lo (kăt′l-ō′) *n., pl.* **-loes** or **-los.** Also **cat·ta·lo**. A hardy, fertile hybrid resulting from a cross between the American buffalo, or bison, and domestic cattle. [CAT(TLE) + (BUFF)ALO.]

cat·a·logue (kăt′l-ôg′, -ŏg′) *n.* Also **cat·a·log** (only form for senses 2 and 3). *Abbr.* **cat.** **1.** A systematized list, usually in alphabetical order, often with descriptions of the listed items. **2.** *Library Service.* A **card catalog** (*see*). **3.** *Library Service.* A publication containing such a list. —*v.* **catalogued, -loguing, -logues.** Also **cat·a·log.** —*tr.* To list in a catalogue; make a catalogue of. —*intr.* To make a catalogue. [Middle English *cateloge*, from Old French *catalogue*, from Late Latin *catalogus*, an enumeration, from Greek *katalogos*, from *katalegein*, to recount, enumerate : *kata-*, thoroughly + *legein*, to gather, speak (see **leg-** in Appendix*).] —**cat′a·log′er** *n.*

Cat·a·lo·ni·a (kăt′l-ō′nē-ə, -nyə). *Spanish* **Ca·ta·lu·ña** (kä′tä-lōō′nyä). A region and former republic of northeastern Spain, bordering on France and the Mediterranean Sea.

ca·tal·pa (kə-tăl′pə, -tôl′pə) *n.* Any of several chiefly North American trees of the genus *Catalpa*, having large leaves, showy clusters of whitish flowers, and long, slender pods. Also called "Indian bean." [Creek *kutuhlpa*, "head with wings" (from the shape of its flowers).]

ca·tal·y·sis (kə-tăl′ə-sĭs) *n.* The action of a catalyst, especially modification of the rate of a chemical reaction by a catalyst. [Greek *katalusis*, dissolution, from *kataluein*, to dissolve : *kata-*, down + *luein*, to loosen, release (see **leu-**[1] in Appendix*).] —**cat′a·lyt′ic** (kăt′l-ĭt′ĭk) *adj.* —**cat′a·lyt′i·cal·ly** *adv.*

cat·a·lyst (kăt′l-ĭst) *n.* **1.** *Chemistry.* A substance, usually present in small amounts relative to the reactants, that modifies, especially increases, the rate of a chemical reaction without being consumed in the process. **2.** One that precipitates a process or event, especially without being involved in or changed by the consequences. [From CATALYSIS (by analogy with ANALYST and ANALYSIS).]

catalytic converter. A reaction chamber typically containing a finely divided platinum-iridium catalyst into which exhaust gases from an automotive engine are passed together with excess air so that carbon monoxide and hydrocarbon pollutants are oxidized to carbon dioxide and water.

catalytic cracker. An oil refinery unit in which catalytic cracking (*see*) of petroleum is performed.

cat·a·lyze (kăt′l-īz′) *tr.v.* **-lyzed, -lyzing, -lyzes.** To modify the rate of (a chemical reaction) as a catalyst. —**cat′a·lyz′er** *n.*

cat·a·ma·ran (kăt′ə-mə-răn′) *n.* **1.** A boat with two parallel hulls. **2.** A raft of logs or floats lashed together. [Tamil *kaṭṭumaram* : *kaṭṭu-*, to tie + *maram*, tree, timber.]

cat·a·me·ni·a (kăt′ə-mē′nē-ə) *n.* *Physiology.* Menses. [New Latin, from Greek *katamēnia*, neuter plural of *katamēnios*, monthly : *kata-*, according to + *mēn*, month (see **mē-**[2] in Appendix*).] —**cat′a·me′ni·al** *adj.*

cat·a·mite (kăt′ə-mīt′) *n.* A boy kept by a pederast. [Latin *catamītus*, from *Catamītus*, Ganymede, from Etruscan *Catmite*, from Greek *Ganumēdēs*, GANYMEDE (cupbearer of the gods).]

cat·a·mount (kăt′ə-mount′) *n.* Also **cat·a·moun·tain** (kăt′ə-moun′tən). Any of various wild felines, such as a mountain lion or a lynx. [Short for catamountain, variant of earlier *cat of the mountain*.]

Ca·ta·nia (kə-tän′yə; *Italian* kä-tä′nyä). The second-largest city of Sicily, Italy, on the eastern shore. Population, 364,000.

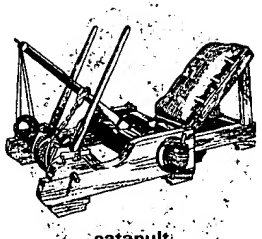
cat·a·pho·re·sis (kăt′ə-fə-rē′sĭs) *n.* *Chemistry.* **Electrophoresis** (*see*). [New Latin : CATA- + -PHORESIS.] —**cat′a·pho·ret′ic** (-rĕt′ĭk) *adj.* —**cat′a·pho·ret′i·cal·ly** *adv.*

cat·a·phyll (kăt′ə-fĭl′) *n.* *Botany.* A modified or rudimentary leaf, such as a bud scale. [CATA- + -PHYLL (translation of German *Niederblatt*, "lower leaf").]

cat·a·pla·sia (kăt′ə-plā′zhə, -zhē-ə) *n.* Degenerative reversion of cells or tissue to a less differentiated form. [New Latin : CATA- + -PLASIA.] —**cat′a·plas′tic** (-plăs′tĭk) *adj.*

cat·a·plasm (kăt′ə-plăz′əm) *n.* *Medicine.* A **poultice** (*see*). [Old French *cataplasme*, from Late Latin *cataplasma*, from Greek *kataplasma*, from *kataplassein*, to plaster over : *kata-*, thoroughly + *plassein*, to mold (see **plasma**).]

cat·a·pult (kăt′ə-pŭlt′) *n.* **1.** An ancient military machine for hurling large stones, arrows, or other missiles. **2.** A mechanism for launching aircraft without a runway, as from the deck of a ship. **3.** A slingshot. —*v.* **catapulted, -pulting, -pults.** —*tr.* To hurl or launch from or as if from a catapult. —*intr.* To become catapulted; spring up abruptly. [Old French *catapulte*, from Latin *catapulta*, from Greek *katapaltēs*, *katepeltēs* : *kata-*, down + *pallein*, to sway, brandish (see **pōl-** in Appendix*).]



catapult
Roman catapult

cat·a·ract (kăt′ə-răkt′) *n.* **1.** A very large waterfall. **2.** A great downpour. **3.** *Pathology.* Opacity of the lens or capsule of the eye, causing partial or total blindness. [Middle English *cataracte*, floodgate, from Old French, portcullis, cataract (of the eye), from Latin *catarractēs*, waterfall, portcullis, from Greek *katar(rh)aktēs*, "a down-swooping," from *katarassein*, to dash down : *kata-*, down + *rassein*, to strike (see **wrāgh-**[2] in Appendix*).]

ca·tarrh (kə-tär′) *n.* Inflammation of mucous membranes, especially of the nose and throat. [Old French *catarrhe*, from Late Latin *catarrhus*, from Greek *katarrhous*, a flowing down, from *katarrhein*, to flow down : *kata-*, down + *rhein*, to flow (see **sreu-** in Appendix*).] —**ca·tarrh′al, ca·tarrh′ous** *adj.*

cat·arrh·ine (kăt′ə-rĭn′) *adj.* Of or designating a group of primates that includes the Old World monkeys, apes, and man; characterized by close-set nostrils directed forward or downward. —*n.* A catarrhine primate. [New Latin *Catarrhina*, from Greek *katarrhin*, hook-nosed : *kata-*, down + *rhis* (stem *rhin-*), nose (see **rhino-**).]

ca·tas·ta·sis (kə-tăs′tə-sĭs) *n., pl.* **-ses** (-sēz′). **1.** In classical tragedy, the intensified part of the action directly preceding the catastrophe. **2.** The climax of a play. [Greek *katastasis*, settlement, establishment, from *kathistanai*, to set in order, bring down : *kata-*, down + *histanai*, to set, place (see **stā-**[1] in Appendix*).]

ca·tas·tro·phe (kə-tăs′trə-fē) *n.* **1.** A great and sudden calamity; disaster. **2.** A sudden violent change in the earth's surface; cataclysm. **3.** The dénouement of a play, especially a classical tragedy. —See Synonyms at **disaster**. [Greek *katastrophē*, from *katastrephein*, to turn down, overturn : *kata-*, down + *strephein*, to turn (see **strebh-** in Appendix*).] —**cat′a·stroph′ic** (kăt′ə-strŏf′ĭk) *adj.* —**cat′a·stroph′i·cal·ly** *adv.*

cat·a·to·ni·a (kăt′ə-tō′nē-ə) *n.* A schizophrenic disorder characterized by plastic immobility of the limbs, stupor, negativism, and mutism. [New Latin, from German *Katatonie* : CATA- + -TONIA.] —**cat′a·ton′ic** (-tŏn′ĭk) *adj.* & *n.*

Ca·taw·ba (kə-tô′bə) *n., pl.* **Catawba** or **-bas** (only form for sense 4). **1.** A Siouan-speaking tribe of North American Indians formerly living along the Catawba River in the Carolinas. **2.** A member of this tribe. **3.** The Siouan language of this tribe. **4.** A light-red North American grape developed from the fox grape, *Vitis labrusca*. **5.** Wine made from these grapes.

Ca·taw·ba River (kə-tô′bə). A river rising in western North Carolina and flowing 250 miles into South Carolina.

cat·bird (kăt′bûrd′) *n.* A North American songbird, *Dumetella carolinensis*, having predominantly slate-gray plumage. [From one of its calls, resembling the mewing of a cat.]

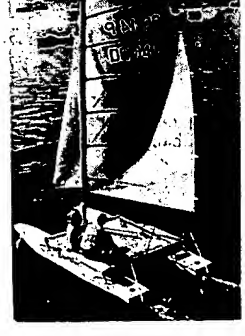
cat·boat (kăt′bōt′) *n.* A broad-beamed sailboat carrying a single sail on a mast stepped well forward.

cat·bri·er (kăt′brī′ər) *n.* Any of several thorny vines of the genus *Smilax*, especially *S. rotundifolia*, having heart-shaped leaves, small green flowers, and blackish berries. Also called "greenbrier." [CAT + BRIER (from its prickles).]

cat·call (kăt′kôl′) *n.* A harsh or shrill call or whistle expressing disapproval or derision. —*v.* **catcalled, -calling, -calls.** —*tr.* To express disapproval of with catcalls. —*intr.* To sound catcalls.

catch (kăch) *v.* **caught** (kôt), **catching, catches.** —*tr.* **1.** To capture or seize, especially after a chase. **2.** To take by trapping or snaring. **3.** To come upon suddenly, unexpectedly, or accidentally. **4. a.** To lay hold of forcibly or suddenly; grasp. **b.** To grab so as to stop the motion of. **5. a.** To overtake. **b.** To reach in time to board, attend, or the like. **6. a.** To entangle; grip. **b.** To cause to become suddenly or accidentally hooked, en-

catalpa
Catalpa bignonioides
Above: Leaves and pods
Below: Flower



catamaran

APPENDIX

1. (Previously Presented) Propellant for gas generators, comprising

(a) at least one fuel selected from the group consisting of guanidine nitrate, dicyanamide, ammonium dicyanamide, sodium dicyanamide, copper dicyanamide, tin dicyanamide, calcium dicyanamide, guanidine dicyanamide, aminoguanidine bicarbonate, aminoguanidine nitrate, triaminoguanidine nitrate, nitroguanidine, dicyandiamide, azodicarbonamide, tetrazole, 5-aminotetrazole, 5-nitro-1,2,4-triazole-3-on, salts and mixtures thereof;

(b) at least one of an alkali metal nitrate, an alkaline earth metal nitrate, ammonium nitrate, an alkali metal chlorate, an alkaline earth metal chlorate, ammonium chlorate, an alkali metal perchlorate, an alkaline earth metal chlorate, or ammonium perchlorate, and

(c) at least one essentially chemically-inert slag trap with a high fusion point, said slag trap being at least one of Al_2O_3, TiO_2, or ZrO_2 particles formed by a gas phase reaction so as to have a specific surface area of at least about 40 m^2g.

2. (Previously Presented) Propellant for gas generators according to claim 1, wherein component (a) is present in an amount of about 20 to 60 wt.-%, component (b) is present in an amount of about 38 to about 63 wt.-%, and component (c) is present in an amount of about 5 to 22 wt.-%.

3. (Previously Presented) Propellant for gas generators according to claim 1, wherein component (a) is selected from the group consisting of nitroguanidine, 5-aminotetrazole, dicyandiamide, dicyanamide, sodium- and calcium dicyanamide, guanidine nitrate, and mixtures thereof.

4. (Previously Presented) Propellant for gas generators according to claim 1, wherein component (b) is selected from the group consisting of sodium-, potassium- and strontium nitrate.

5. (Previously Presented) Propellant for gas generators according to claim 1, wherein a portion of the particles comprising component (c) include a layer of platinum metal or a metal alloy of platinum metals or copper in a catalytically effective thickness.

6. (Previously Presented) Propellant for gas generators according to claim 5, wherein the platinum metal is selected from ruthenium, osmium, rhodium, iridium, palladium and platinum.

7. (Previously Presented) Propellant for gas generators according to claim 5, wherein the metal alloy of platinum metals is at least one of a Pt/Pd alloy or a Pt/Rh alloy.

8. (Previously Presented) Propellant for gas generators according to claim 5, wherein the weight portion of the catalyst with respect to component (c) is 0.1 to 5 wt.-%.

9. (Previously Presented) Propellant for gas generators according to claim 1, wherein component (a) is nitroguanidine, component (b) is strontium nitrate and component (c) is highly dispersed Al_2O_3, TiO_2 or ZrO_2.

10. (Original) Propellant for gas generators according to claim 9, wherein component (a) is present in an amount of 45 to 51 wt.-%, components (b) is present in an amount of 39 to 45 wt.-% and component (c) is present in an amount of 9 to 11 wt.-%, with respect to the total composition.

11. (Previously Presented) Propellant for gas generators according to claim 1, further including a component (d) that is at least one slag former selected from the group consisting of alkali metal carbonates, alkaline earth metal carbonates, alkali metal oxides, alkaline earth metal oxides, silicates, aluminates, aluminum silicates, silicon nitride and iron(III)oxide.

12. (Previously Presented) Propellant for gas generators according to claim 11, wherein component (d) is present in an amount of about 2 to 12 wt.-%.

13. (Previously Presented) Propellant for gas generators according to claim 1, further including a component (e) that is at least one binder being soluble in water at room temperature.

14. (Previously Presented) Propellant for gas generators according to claim 1, further including a component (e) that is at least one binder selected from the group consisting of cellulose compounds, polymers of one or more polymerizable olefinic unsaturated monomers, a metal salt of stearic acid being insoluble in water at room temperature and graphite.

15. (Previously Presented) Propellant for gas generators according to claim 14, wherein the binder is present in an amount of 0 to 2 wt.-%.

16. (Previously Presented) Propellant for gas generators according to claim 1, wherein the propellant is suitable for use as at least one of a gas-generating agent in airbags, an extinguishing agent or a propellant.

17. (Previously Presented) Propellant for gas generators according to claim 1, wherein component (a) is present in an amount of about 28 to 52 wt.-%, component (b) is present in an amount of about 38 to about 55 wt.-%, and component (c) is present in an amount of about 8 to 20 wt.-%.

18. (Previously Presented) Propellant for gas generators according to claim 1, wherein component (a) is present in an amount of about 45 to 51 wt.-%, component (b) is present in an amount of about 39 to about 45 wt.-%, and component (c) is present in an amount of about 9 to 11 wt.-%.

19. (Previously Presented) Propellant for gas generators according to claim 5, wherein the weight portion of the catalyst with respect to component (c) is 0.2 to 1.2 wt.-%.

20. (Previously Presented) Propellant for gas generators according to claim 11, wherein component (d) is present in an amount of about 4 to 10 wt.-%.

21. (Previously Presented) Propellant for gas generators according to claim 14, wherein the binder is present in an amount of 0.3 to 0.8 wt.-%.

22. (Previously Presented) Propellant for gas generators, comprising

(a) at least one fuel selected from the group consisting of guanidine nitrate, dicyanamide, ammonium dicyanamide, sodium dicyanamide, copper dicyanamide, tin dicyanamide, calcium dicyanamide, guanidine dicyanamide, aminoguanidine bicarbonate, aminoguanidine nitrate, triaminoguanidine nitrate, nitroguanidine, dicyandiamide, azodicarbonamide, tetrazole, 5-aminotetrazole, 5-nitro-1,2,4-triazole-3-on, salts and mixtures thereof;

(b) at least one of an alkali metal nitrate, an alkaline earth metal nitrate, ammonium nitrate, an alkali metal chlorate, an alkaline earth metal chlorate, ammonium chlorate, an alkali metal perchlorate, an alkaline earth metal chlorate, or ammonium perchlorate, and

(c) at least one essentially chemically-inert slag trap with a high fusion point, said slag trap being at least one of highly dispersed Al_2O_3, TiO_2, or ZrO_2 particles formed by a gas phase reaction so as to have a specific surface area of at least about 40 m^2g.

23. (Previously Presented) Propellant for gas generators, comprising

(a) at least one fuel selected from the group consisting of guanidine nitrate, dicyanamide, ammonium dicyanamide, sodium dicyanamide, copper dicyanamide, tin dicyanamide, calcium dicyanamide, guanidine dicyanamide, aminoguanidine bicarbonate, aminoguanidine nitrate, triaminoguanidine nitrate, nitroguanidine, dicyandiamide, azodicarbonamide, tetrazole, 5-aminotetrazole, 5-nitro-1,2,4-triazole-3-on, salts and mixtures thereof;

(b) at least one of an alkali metal nitrate, an alkaline earth metal nitrate, ammonium nitrate, an alkali metal chlorate, an alkaline earth metal chlorate, ammonium chlorate, an alkali metal perchlorate, an alkaline earth metal chlorate, or ammonium perchlorate, and

(c) at least one essentially chemically-inert slag trap with a high fusion point, said slag trap being at least one of highly dispersed Al_2O_3, TiO_2, or ZrO_2 particles formed by a gas phase reaction so as to have a specific surface area of at least about 40 m^2g, wherein a portion of the particles include a layer of platinum metal or a metal alloy of platinum metals or copper in a catalytic effective thickness.